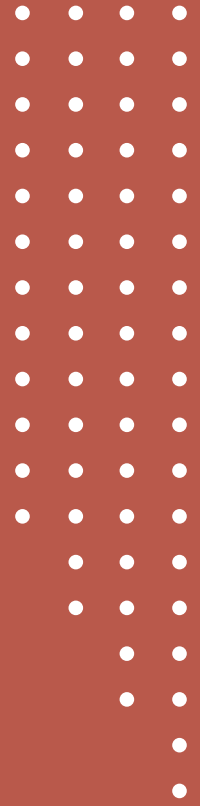


Chapter 1

INTRODUCTION



INTRODUCTION

In May 1996, the New Jersey State Board of Education adopted *Core Curriculum Content Standards* in seven subject areas as well as a set of *Cross-Content Workplace Readiness Standards*. One month later, the Board authorized the development of this document, the *New Jersey Science Curriculum Framework*, intended to be the first in a complete series of frameworks designed to assist educators throughout the state in the development and implementation of standards-based instructional programs. This *Framework* represents the time and effort of dozens of scientists, educators, and industry leaders who served on panels, committees, and subcommittees. We hope that it will be a useful document for teachers, curriculum developers, administrators, and parents—one that will define and illuminate effective science education in New Jersey.

HISTORY OF THE STANDARDS

Efforts to develop curriculum standards for New Jersey's public schools actually began in the fall of 1992, when a project was initiated by the Department of Education to establish standards that could be used to measure student achievement as part of the process of monitoring schools. A panel of educators and community representatives met regularly during the 1992-93 school year to draft a set of science standards. The panel was fortunate to be working at a time when a prestigious national effort was already underway, proposing science content and program standards. This national effort had been mobilized in response to a demand throughout the country for increased scientific literacy and needed reforms in the way science was taught. New Jersey's *Science Standards*, informed by the national standards, were tailored to the unique needs and resources within our state but still reflect the rigor and comprehensive coverage characteristic of the national initiative.

In June 1993, a draft set of *Science Standards*, along with standards in other content areas, were submitted to the state Commissioner of Education for dissemination and public review. Plans for gathering reaction to the proposed *Science Standards* coincided nicely with the availability of funding from the Mid-Atlantic Eisenhower Consortium and the New Jersey Statewide Systemic Initiative for the Reform of Science, Math, and Technology Education. The review process began in earnest in the fall of 1993 with the distribution of the standards among science educators and the collecting of responses via surveys and feedback sessions.

A first revision of the *Science Standards* was in the planning stage when Governor Christine Whitman, early in 1995, made the development of core curriculum content standards a high priority as part of her plans to improve public education in New Jersey. With the full backing of the state Department of Education, the process of review and revision was greatly accelerated as the draft standards in all subject areas were published in newspapers and enjoyed widespread exposure. Focus groups were convened throughout the state, and working groups of educators and business leaders were established to make changes in response to the feedback collected.

Paying close attention to the responses collected, the science panel generated a revised draft of the standards, which was submitted to the Commissioner's office in December 1995. By then, the national effort had resulted in two widely respected publications: AAAS's *Benchmarks for Scientific*

Literacy (Oxford University Press) and the National Research Council's *National Science Education Standards* (National Academy Press). The submitted version of New Jersey's *Science Standards* agreed with the spirit of these nationally accepted models for effective science instruction.

The revised draft of the state standards underwent exhaustive scrutiny by the Commissioner's office, the State Board of Education, and committees of state legislators, who provided additional opportunities for public comment by holding a series of statewide hearings. New Jersey's *Core Curriculum Content Standards* were adopted by the State Board of Education in May 1996. The *Science Standards*, in particular, were acknowledged and praised for their clarity and appropriateness. As mentioned above, work began on the New Jersey Science Curriculum *Framework* during the following month.

Note: Chapter 2 of this document lists the *Science Standards* and *Cross-Content Workplace Readiness Standards*. A complete listing of these standards and the accompanying indicators can be found in appendix A.

PURPOSE AND ORGANIZATION OF THE NEW JERSEY SCIENCE CURRICULUM FRAMEWORK

Purpose of the *Framework*

In New Jersey, each local school district is responsible for the selection of instructional materials as well as the design and implementation of an effective curriculum. This *Framework* is intended to complement and inform (rather than usurp) the local processes. Steadfastly focused on the standards, the chapters discuss essential components of a quality K-12 science program and include the thinking of selected contributors to the national reform movements.

It is expected that among the most useful chapters will be chapters 7 and 8, which center on the standards themselves. These chapters add detail to the importance and meaning of the standards. Chapter 8 provides examples of learning activities that illustrate the teaching of particular concepts inherent in each of the seven content standards. To better understand the role of these chapters, and in particular the intent of the sample learning activities, users of the *Framework* should be familiar with the overall organization of New Jersey's *Core Curriculum Content Standards*.

Organization of the *Framework*

There are twelve *Science Standards*, each accompanied by a set of cumulative progress indicators (CPIs) that are grouped for grade-level appropriateness. Five of these standards (5.1-5.5, referred to in this document as *Science Standards 1-5*) speak to the nature and processes of science and therefore apply to all disciplines found in a comprehensive science program. The five science "process" standards are briefly discussed in chapter 7.

The seven “content” standards (5.6-5.12, referred to in this document as *Science Standards 6-12*) are easily recognized as addressing fundamental understandings in the life, earth, physical, and environmental sciences. Each of these content standards begins with an introduction that details the importance of each standard and traces the development of major concepts as learners progress from kindergarten through high school. One or more sample learning activities are included for each indicator of each science content standard. Because of this comprehensive coverage, chapter 8 comprises the bulk of this document. **However, this format in no way implies that science content is more important than process. Indeed, most science educators would believe otherwise.** The format was decided upon to enable the writers to include examples of learning activities in all areas of science at all grade levels. It will be obvious to the user of this *Framework* that each selected illustration (learning activity) teaches science process skills as well as content.

Adjacent to each sample learning activity, when appropriate, are cross-references to “Related Science Standards” and/or appropriate *Cross-Content Workplace Readiness Standards* (“Related Workplace Readiness Standards”). Also found in the margin (under the heading, “Supporting Educational Research”) are related references such as *Benchmarks for Scientific Literacy* or the *National Science Education Standards*. These latter references have been included to verify the developmental appropriateness of the suggested activity.

It is most important that the purpose of these illustrations be clearly understood. **The New Jersey Science Curriculum Framework will not serve as a statewide science program. As previously mentioned, curriculum design will remain the responsibility of each local district. Nor will the Framework serve as a teacher’s manual for the implementation of the standards.** The authors of each chapter were asked for sample learning activities that describe rather than prescribe classroom activity—examples that inspire rather than require specific instructional strategies.

What became apparent as the chapters were being assembled was the ease with which many of the suggested activities could be incorporated into interdisciplinary thematic units, integrating learning from language arts, social studies, mathematics, the arts, and other subjects. Exploring links to other subjects is just one example of the creative program planning that it is hoped the *New Jersey Science Curriculum Framework* will facilitate and inspire.

SCIENCE FOR ALL STUDENTS

New Jersey’s *Science Standards* have been written for all students! The authors of the standards as well as the authors of this *Framework* believe that every student in New Jersey is capable of and deserving of a science education that will prepare her or him for a productive future in our increasingly technological society. It need not be stated that gender, race, and ethnicity pose no restrictions to the learning of science. There is greater concern, however, that the standards might be unrealistic or even unreachable for students of limited ability or those with classified learning disabil-

ities. Since a stated purpose of the *New Jersey Science Curriculum Framework* is to **assist all students to achieve the standards**, a section has been included that suggests modifications of selected learning activities. Chapter 9 of this document offers instructional strategies for working with students with special needs.

A WORD ABOUT SAFETY

New Jersey's *Science Standards* encourage the teaching of science as a hands-on experience in the classroom, in the laboratory, or outdoors. With this commitment to learn science by doing science comes the responsibility to provide for the safety of students as they learn and to instill in them their own sense of responsibility towards the development and practice of sound safety procedures.

An earlier draft of the science standards included a thirteenth standard, which established the importance of safety as part of a quality science program. However, science is certainly not the only aspect of the school program where safety procedures must be learned and practiced. Consequently, Cross-Content Workplace Readiness Standard #5 was formulated to stress the importance of safety in all walks of life. The *New Jersey Science Curriculum Framework* would, however, be incomplete without strongly emphasizing **the need for constant attention to safety** at every grade level. A more complete discussion of the importance of safety in a science program can be found in the *National Science Education Standards* and many other professional publications.

As mentioned in the preceding paragraph, an ongoing effort will be made to keep this document current and in tune with the needs of its users. In response to the first draft (1997), the science education community has already contributed meaningful suggestions for the inclusion of additional and valuable information. In an attempt to add useful ideas and at the same time keep the Framework manageable in terms of its size and organization, it has been decided to prepare a series of companion documents that will specifically address the needs of particular users. As of this writing, the following supplements are under consideration:

Science Assessments Activities. Chapter 5 of this Framework addresses the need for assessing student performance within the science classroom in a variety of ways. This supplement will provide models of alternate assessment activities (including examples of activities being designed as part of the state assessment program). Included will be suggestions to the teacher for the design of science assessments and scoring strategies linked to the standards and indicators.

Safety in the Elementary Science Classroom. The overarching need for safety as an ever present ingredient of science instruction is mentioned above and particular need to assist elementary school teachers, who are asked by the standards to expand the role of “hands-on” science instruction, has been identified. In response, an elementary science safety manual will be prepared to accompany the *New Jersey Science Curriculum Framework*.

YOUR FEEDBACK IS ENCOURAGED!

The *New Jersey Science Curriculum Framework*, like the standards themselves, is intended to be a “living” document, subject to periodic review and revision. Comments and suggestions regarding the *Framework* should be submitted to the New Jersey State Department of Education (Attention: Science Coordinator) P.O. Box 500, 100 Riverview Plaza, Trenton, NJ 08625-0500.